Lipase-Catalyzed Biodiesel Production with Methyl Acetate as Acyl Acceptor

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Biodiesel is an alternative diesel fuel made from renewable biological resources. During the process of biodiesel production, lipase-catalyzed transesterification is a crucial step. However, current techniques using methanol as acyl acceptor have lower enzymatic activity; this limits the application of such techniques in large-scale biodiesel production. Furthermore, the lipid feedstock of currently available techniques is limited. In this paper, the technique of lipase-catalyzed transesterification of five different oils for biodiesel production with methyl acetate as acyl acceptor was investigated, and the transesterification reaction conditions were optimized. The operation stability of lipase under the obtained optimal conditions was further examined. The results showed that under optimal transesterification conditions, both plant oils and animal fats led to high yields of methyl ester: cotton-seed oil, 98%; rape-seed oil, 95%; soybean oil, 91%; tea-seed oil, 92%; and lard, 95%. Crude and refined cotton-seed oil or lard made no significant difference in yields of methyl ester. No loss of enzymatic activity was detected for lipase after being repeatedly used for 40 cycles (ca. 800 h), which indicates that the operational stability of lipase was fairly good under these conditions. Our results suggest that cotton-seed oil, rape-seed oil and lard might substitute soybean oil as suitable lipid feedstock for biodiesel production. Our results also show that our technique is fit for various lipid feedstocks both from plants and animals, and presents a very promising way for the large-scale biodiesel production.

Key words: Biodiesel, Methyl Acetate, Transesterification, Lard